

AREAL GEOLOGY OF JEFFERSON COUNTY, ALABAMA



GEOLOGICAL SURVEY OF ALABAMA

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ATLAS 15

**AREAL GEOLOGY OF
JEFFERSON COUNTY, ALABAMA**

By Jack T. Kidd

with a section on
LINEAMENTS

By Karen E. Richter

This atlas was compiled and published as part of a cooperative program by Jefferson County; the cities of Birmingham, Homewood, Gardendale, and Pleasant Grove; U.S. Geological Survey; and Geological Survey of Alabama.

University, Alabama
1979

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The Alabama Valley and Ridge section consists of northeast-southwest-trending valleys and ridges and includes Birmingham Valley, Cahaba Ridges, Cahaba Valley, and Coosa Ridges. The Cumberland Plateau section is characteristically a dissected plateau of moderate relief and includes the Warrior Basin and the southern extension of Murphrees Valley and Blount Mountain (Sapp and Emplainscourt, 1975).

The Birmingham Valley is approximately 45 miles long and ranges from 3 to 7 miles in width. It extends from near the Jefferson-St. Clair County boundary in the northeast to near the Tuscaloosa-Bibb-Jefferson County boundaries to the southwest. The southwestern end of the valley is obscured by Coastal Plain sediments south of the Bucksville area, and the northeastern end of the valley merges with Big Canoe Valley in western St. Clair County. Birmingham Valley is bounded on the northwest by an escarpment formed by the Pottsville Formation. This escarpment includes Rock Mountain along the southwestern edge of the valley and Sand Mountain along the northwestern edge. The northern part of Birmingham Valley is bounded by the southwestern extensions of Murphrees Valley and Blount Mountain and merges with Big Canoe Valley in St. Clair County. The southeastern side of Birmingham Valley is bounded by escarpments formed by the Parkwood and Pottsville Formations. These escarpments are known locally as Shades and Little Shades Mountains. The central part of the Birmingham Valley is separated into two smaller valleys by Flint Ridge. Opossum Valley lies to the west of Flint Ridge and Jones Valley to the east.

Red Mountain, which is located along the eastern side of the Birmingham Valley, is a narrow prominent ridge that trends northeast-southwest and separates Shades Valley on the southeast from Jones Valley on the northwest. Red Mountain is so named for the characteristic red soil and rocks of the iron-bearing Red Mountain Formation which crops out along the crest.

The Cahaba Ridges are located in eastern Jefferson County between Birmingham and Cahaba Valleys. The Cahaba Ridges consist of a group of parallel, linear, northeast-southwest-trending ridges and valleys formed by the sandstones and shales of the Pottsville and Parkwood Formations.

Cahaba Valley is located between the Cahaba Ridges to the northwest and the Coosa Ridges to the southeast. Cahaba Valley in Jefferson County is about 10 miles long and 2 to 3 miles wide. The valley is underlain predominantly by non-resistant carbonate and shale beds that are generally highly folded and faulted. The Cahaba Valley-Cahaba Ridges boundary is marked by the Helena fault and a long, narrow valley developed upon the shales of the Rome Formation.

The Cahaba Valley is bounded on the southeast by the Coosa Ridges, which consist of northeast-southwest-trending, subparallel ridges and valleys formed by sandstones and shales of the Pottsville and Parkwood Formations. In Jefferson County, the Coosa Ridges are bounded on the northwest by Oak Mountain, a prominent escarpment overlooking the Cahaba Valley.

The Cumberland Plateau section in northern and western Jefferson County consists of Blount Mountain, Murphrees Valley, and the Warrior Basin. Blount Mountain is a prominent steep-sided dissected plateau underlain by gently dipping beds of the Pottsville Formation. In Jefferson County, Blount Mountain is bounded on the south and southeast by Birmingham Valley and on the west by Murphrees Valley. Murphrees Valley is a faulted anticlinal valley that contains inner valleys and ridges. Murphrees Valley is bounded on the west by the Warrior Basin and merges with Birmingham Valley to the south. The Warrior Basin is a broad dissected upland developed upon gently dipping beds of the Pottsville Formation.

GENERAL GEOLOGY

Jefferson County is underlain by more than 10,000 feet of sedimentary rocks (table 1) that are generally flat-lying in the northwest and folded and faulted in the southeast. The flat-lying rocks of the Warrior Basin in northwestern Jefferson County are separated from the faulted and folded rocks of the Valley and Ridge in southeastern Jefferson County by the Appalachian structural front, a tectonic zone located along the northwestern edge of the Birmingham Valley.

Exposures of bedrock in Jefferson County range in age from Cambrian to Pennsylvanian (fig. 2). Mixed carbonate and clastic rocks of Cambrian age are generally exposed along the axes of the eroded anticlines and adjacent to the major thrust faults. Rocks ranging in age from Cambrian to Mississippian, including clastic and carbonate formations, occur along the flanks of the anticlines, and resistant sandstones and shales of Pennsylvanian age underlie the Warrior Basin and cap the higher ridges in the county. Sand, clay, and gravel deposits of Late Cretaceous age occur as outliers near the boundaries with Tuscaloosa and Bibb Counties. Unconsolidated alluvial deposits of Quaternary age, composed mainly of clay, sand and gravel, occur along and generally parallel to the streams and rivers in the area and as isolated terrace deposits in areas away from the present streams. These latter deposits were formed when beds of ancestral streams in the area were at higher elevations than today's streams.

CAMBRIAN

ROME FORMATION

The Rome Formation is about 500 feet thick and consists of greenish-gray and grayish-red shale with rare thin beds of argillaceous limestone, chert and sandstone. The Rome crops out only in the Cahaba Valley in a thin belt adjacent to the Helena thrust fault.

CONASAUGA FORMATION

The Conasauga Formation consists of thin-bedded, dark- to brownish-gray sublithographic limestone, light-olive to medium-gray shale, and brownish-gray dolomite. Chert locally occurs in the residuum as thin prismatic fragments. The Conasauga is estimated to be 1,100 to 1,900 feet thick and occurs throughout Jones and Opossum Valleys but is absent in the Cahaba Valley (Butts, 1910).

KETONA DOLOMITE

The Ketona consists of 400 to 600 feet of relatively pure chert-free light-brownish-gray to yellowish-gray crystalline thick-bedded dolomite with lesser amounts of brownish-gray dolomite occurring near the contact with the underlying Conasauga Formation. The Ketona is present throughout the Cahaba and Opossum Valleys and Jones Valley north of McCalla; south of the McCalla area, the Ketona is absent.

CAMBRIAN AND ORDOVICIAN

KNOX GROUP UNDIFFERENTIATED

The Knox Group consists of medium- to light-gray thick-bedded cherty dolomite with lesser amounts of limestone and dolomitic limestone. The Knox generally weathers to irregular boulders and fragments of light-gray to grayish-pink chert and is generally unfossiliferous, although cryptozoans and gastropods occur locally. The Knox occurs throughout Jones, Opossum, and Cahaba Valleys and is estimated to be approximately 2,000 feet thick in the Birming-

MAP EXPLANATION¹

QUATERNARY	<div>Qal</div>	Alluvium and low terrace deposits		Lineaments from LANDSAT band-6 print, February 1977.
	<div>Qt</div>	High terrace deposits		Lineaments from U.S. Geological Survey 7½-minute orthophotoquads, 1975.
	<div>Qt?</div>	Possible terrace of questionable age		Lineaments from National Aeronautics and Space Administration High-altitude color-infrared photography, February 22, 1973.
CRETACEOUS	<div>Kc</div>	Coker Formation: Tuscaloosa Group		
PENNSYLVANIAN	<div>IPpv</div>	Pottsville Formation		
	<div>IPMpw</div>	Parkwood Formation		
MISSISSIPPIAN	<div>Mf</div>	Floyd Shale		Anticline, axial trace
	<div>Mb</div>	Bangor Limestone		Anticline, axial trace showing direction of plunge
	<div>Mh</div>	Hartselle Sandstone		Syncline, axial trace
	<div>Mpm</div>	Pride Mountain Formation		Syncline, axial trace showing direction of plunge
	<div>Mtfp</div>	Tuscumbia Limestone, Fort Payne Chert, and Maury Formation		Fault, relative movement not known
				Normal fault: U, upthrown side; D, downthrown side
DEVONIAN	<div>Dcfm</div>	Chattanooga Shale and Frog Mountain Sandstone		
SILURIAN	<div>Srm</div>	Red Mountain Formation		Thrust fault, T on upper plate
	<div>Oc</div>	Chickamauga Limestone		Fault, showing relative horizontal movement
ORDOVICIAN	<div>Oca</div>	Attalla Chert Conglomerate Member: Chickamauga Limestone		Reverse fault, R on upthrown side
	<div>Ou</div>	Ordovician undifferentiated		Strike and dip of beds
	<div>OEk</div>	Knox Group undifferentiated		Strike and dip of overturned beds
	<div>Ek</div>	Ketona Dolomite		Strike of vertical beds
CAMBRIAN	<div>Ec</div>	Conasauga Formation		Horizontal beds
	<div>Er</div>	Rome Formation		Contact of geologic units, dotted where concealed
				Fault reference number
			Fold reference number	
			Fold reference number	

Formation symbol enclosed in parentheses where formation is concealed.

¹ The illustrated symbols do not necessarily appear on all maps.

Faults, synclines and anticlines are dashed where inferred; dotted where concealed.

GEOLOGICAL SURVEY OF ALABAMA
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MAP 14
BIRMINGHAM NORTH QUADRANGLE
ALABAMA—JEFFERSON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE-1/4 BIRMINGHAM COAL DISTRICT 15 QUADRANGLE



BASE TOPOGRAPHIC MAP BY USGS 1959
PHOTO REVISED 1970

Geology modified from
Kidd and Shannon, 1977

UTM GRID AND 1970 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

AREAL GEOLOGY AND LINEAMENTS OF THE BIRMINGHAM NORTH
QUADRANGLE, ALABAMA

Areal Geology by Jack T. Kidd
Lineaments by Karen E. Richter
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